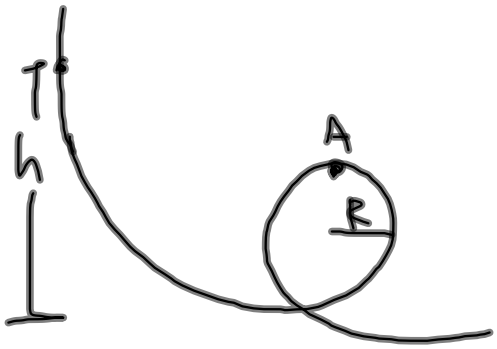
HW Review:

p. 218 : 3



$h = 3.5R$

a) what is speed at point A?

$$E_i = E_f$$

$$K_i + U_{gi} = K_f + U_{gf}$$

$$mgh_i = \frac{1}{2}mv_f^2 + mgh_f$$

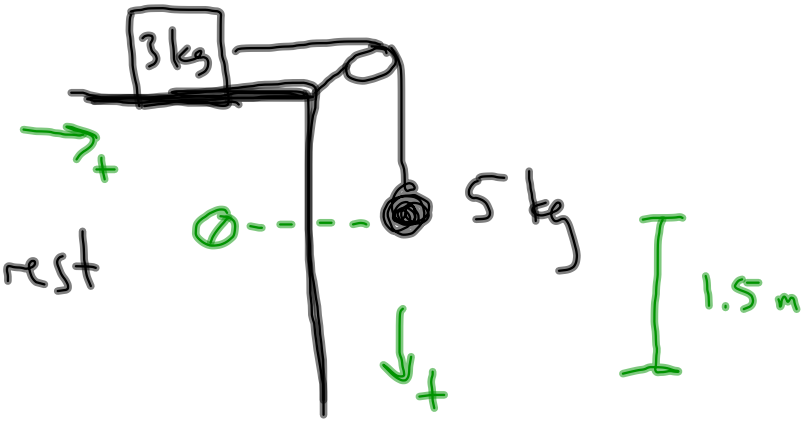
$$v_f = \sqrt{2g(h_i - h_f)}$$

$$= \sqrt{2g(3.5R - 2R)}$$

$$= \sqrt{3gR}$$

b) haven't learned how to do it yet...

P. 220 # 19:



Released from rest

$\mu_k = 0.400$

– find speed of 5 kg mass 1.5 m below starting position

Answer: 3.74 m/s

$m_1 = 3.0\text{ kg}$ $\mu_k = 0.400$

$m_2 = 5.0\text{ kg}$ $h_{i2} = 0\text{ m}$

$m_{Tot} = 8.0\text{ kg}$ $h_{f2} = 1.5\text{ m}$

$v_i = 0\text{ m/s}$

$v_f = ?$

$W = \Delta E$

$F_{NET} = F_{g2} - F_{fk}$

$= m_2 g - \mu_k m_1 g$

$(F_{Net})(d) = \Delta K_{Tot} + \Delta U_{Tot}$

$F_{fk} = \mu_k F_{N1}$

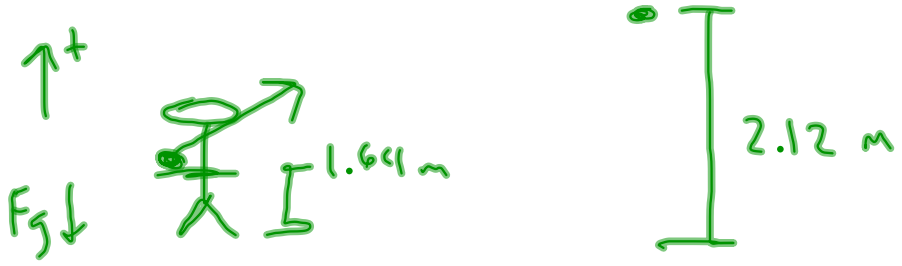
$(F_{g2} - F_{fk})(d) = K_{fTot} - K_{iTot} + U_{fTot} - U_{iTot}$

$= \mu_k m_1 g$

$(m_2 g - \mu_k m_1 g)(d) = \frac{1}{2} m_{Tot} v_f^2 + m_2 g h_f$

$\frac{1}{2} m_{Tot} v_f^2 = m_2 g d - \mu_k m_1 g d - m_2 g h_f$

A shot-putter puts a shot (weight = 71.6 N) that leaves his hand at a distance of 1.64 m above the ground. Find the work done by the gravitational force when the shot has risen to a height of 2.12 m above the ground.



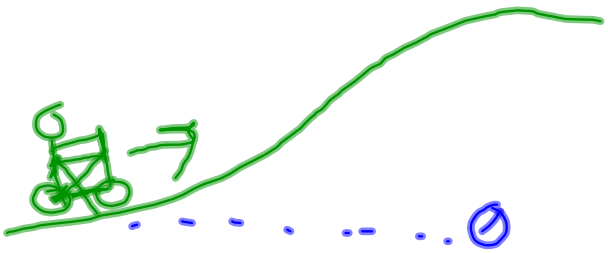
$$W_g = \vec{F}_g \cdot \vec{d}$$

$$= F_g d \cos\theta$$

$$= (71.6\ N)(2.12\ m - 1.64\ m)\cos(180°)$$

$$= -34.4\ J$$

A cyclist approaches the bottom of a gradual hill at a velocity of 16 m/s. The hill is 5.4 m high, and the cyclist estimates that she is going fast enough to coast up and over it without peddling. Ignoring air resistance and friction, find the velocity at which the cyclist crests the hill.



$$E_i = E_f$$

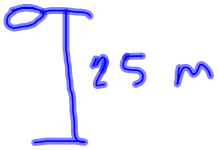
$$K_i + U_{gi}^{\,0} = K_f + U_{gf}$$

$$\frac{1}{2}mv_i^2 = \frac{1}{2}mv_f^2 + mgh_f$$

$$v_f = \sqrt{v_i^2 - 2gh_f}$$

$$= 12.25\ m/s$$

A pitcher throws a 0.14 kg baseball, and it approaches the bat at a speed of 45 m/s. The bat does 70 J of non-conservative work on the ball as they are in contact. Ignoring air resistance, determine the velocity of the ball after the ball leaves the bat and is 25 m above the point of impact.



$m = .14\ kg$

$W = 70\ J$

$$W = \Delta E$$

$$W = \frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2 + mgh_f - mgh_i$$

$$v_f = \sqrt{\frac{2}{m}\left[W + \frac{1}{2}mv_i^2 - mgh_f\right]}$$

$$= \sqrt{\frac{2}{(.14kg)}\left[70\ J + \frac{1}{2}(.14kg)(45 m/s)^2 - (.14kg)(9.8 m/s^2)(25 m)\right]}$$

$$= 50.03\ m/s$$

aside:

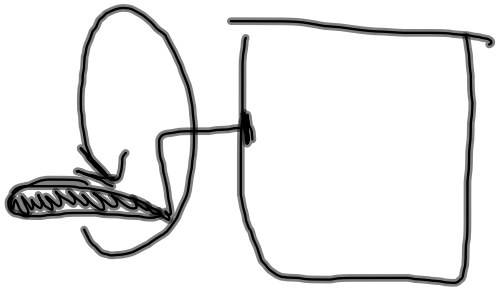
$$W = \Delta K$$

$$W = \frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2$$

$$v_f = \sqrt{\frac{2}{m}\left(W + \frac{1}{2}mv_i^2\right)}$$

$$= 55\ m/s$$

A person is making homemade ice cream. She exerts a force of magnitude of 22 N on the free end of the crank handle, and this end moves in a circular path of radius 0.31 m. The force is always applied parallel to the motion of the handle. If the handle is turned once every 1.2 s, what is the average power being expended?

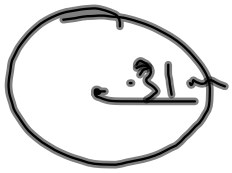


$$P = \frac{W}{t}$$

$$= \frac{F d \cos(0°)}{t}$$

$$= \frac{(22\,N)(.62\,\pi\,m)}{1.2\,s}$$

$$= 35.6\,W$$



Work, Energy, Power:

- Start with conservation or non-conservation of energy

Energy Conserved:

$$E_i = E_f$$

Types of energy →

K, U_s, U_g

$$U_s = \frac{1}{2}kx^2$$

Energy NOT conserved:

$$W = \Delta E$$

Variables →

K, U_s, U_g

$F_{fk}, F_{Drag}, d, \cos\theta$